FLEXIM

PIOX® S

Mass flow measurement without media contact

Flow rate – Concentration – Density

Acids

Caustics

Salts

Solvents

Organic media

Inorganic media

PIOX® S – Measurement from the safe side

PIOX® S721 determines mass flow rate, concentration, density and other parameters by means of clamp-on ultrasonic transducers mounted on the outside of the pipe. The non-invasive acoustic technology is the system of choice when substances and processes place highest demands on safety and reliability.

Precise and reliable

- → Permanently stable measurement without any drift
- → Accurate measurements at the lowest and highest flow velocities
- → Independent of entrained solids or gas
- → Continuous monitoring of measurement quality

Durable and long term stability

- → No media contact, therefore no risk of corrosion
- → No moving parts, no vibrations, no material fatigue
- → No pressure limitations
- → For harsh industrial environments

Safe and available

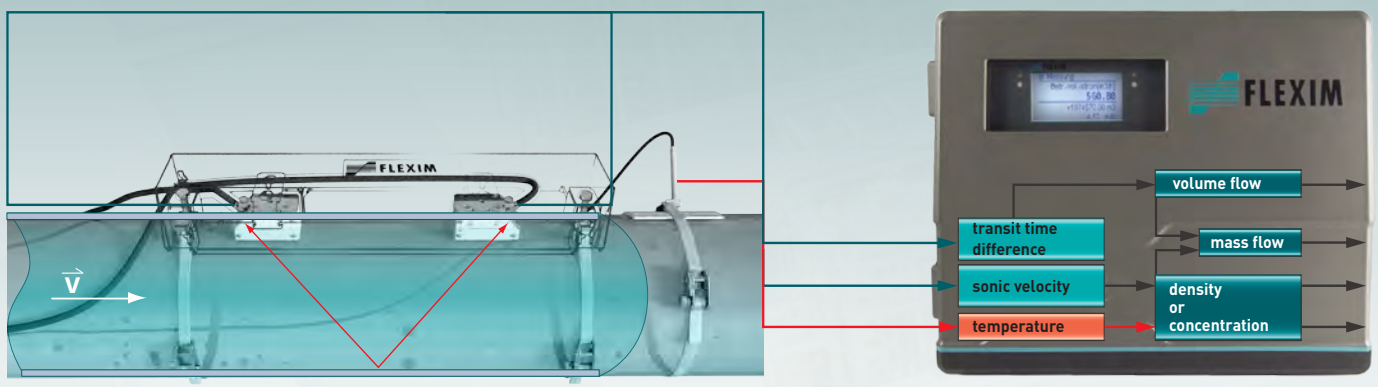
- → Mounting of the measurement system outside of the pipe, no need for pipe modifications
- → Maintenance-free measurement system
- → No leakage risk

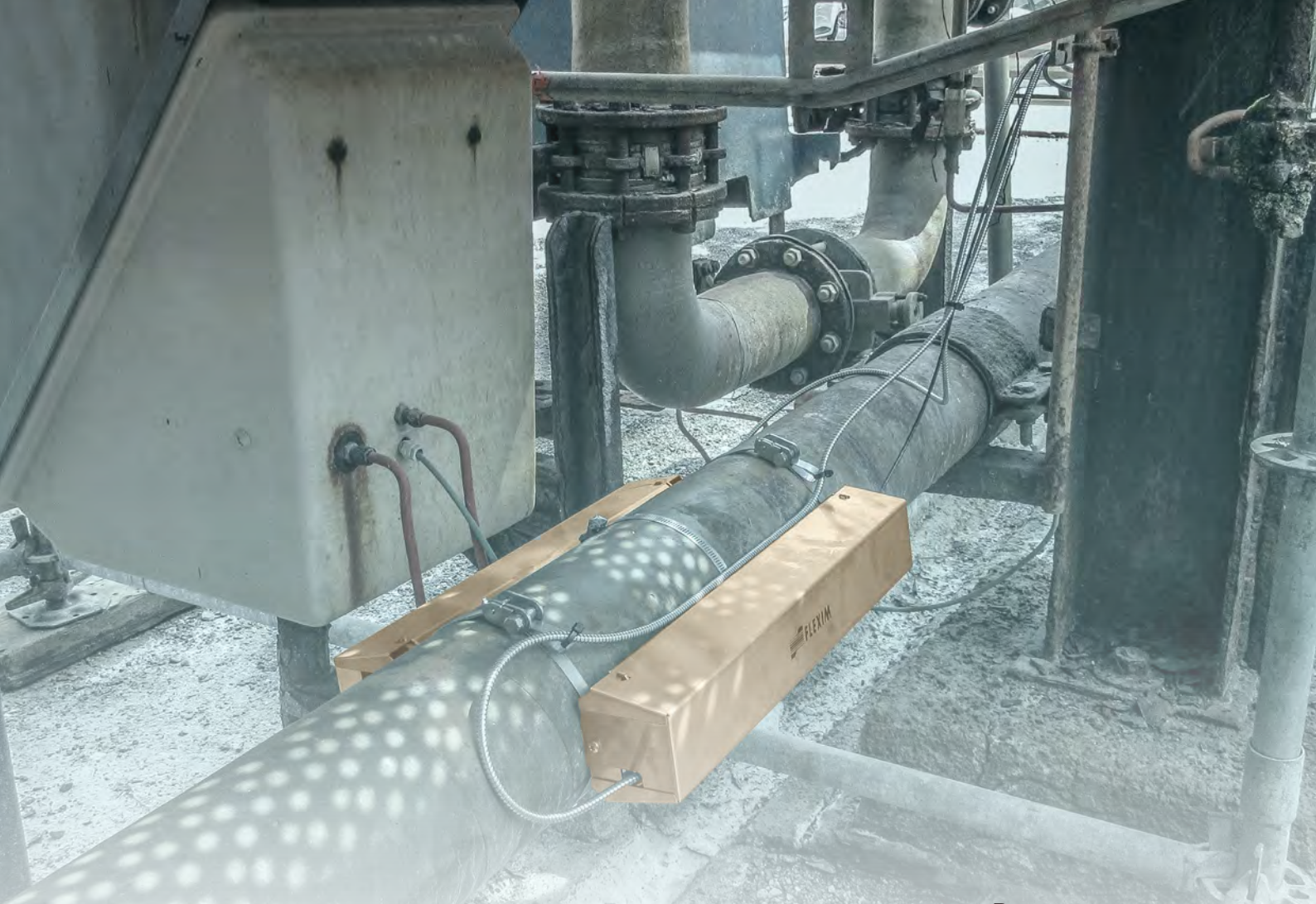
Cost-effective and economical

- → No plant shutdown for commissioning
- → No special materials or bypass solutions required
- → No early failure of measuring system
- → Simultaneous determination of mass flow as well as concentration and density

Indestructible as a matter of principle

PIOX® S721 measures the acoustic velocity, thereby determining the density and concentration of the medium inside the pipe. By simultaneously recording the volume flow rate, PIOX® S721 automatically calculates the mass flow rate.





Unlimited applications

For virtually all pipe sizes and materials – regardless of whether it's steel, plastic, glass or special materials with coatings.

For temperatures up to 400 °C.

For almost all acids, caustics and a wide range of other toxic media.

For hazardous areas – transducers and transmitters are available in ATEX, IEC and FM-certified variants.

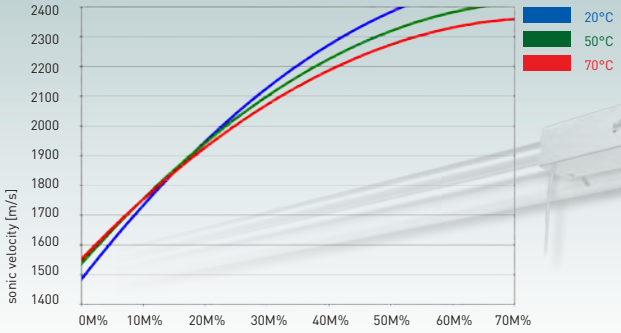
For 100% plant availability – the measurement point can be set up during ongoing operation.

Proven measurement:

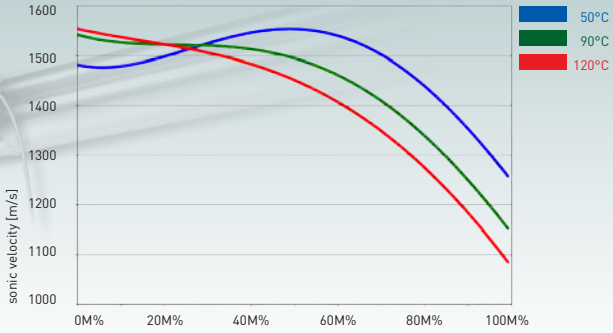
- Nitric acid
- Sulphuric acid
- Hydrofluoric acid
- Phosphoric acid
- Sodium / Potassium hydroxide solution
- Ammonia
- Ammonium nitrate
- Salt solutions
- Alcohols, Glycols
- Caprolactam
- and many other media

In a large number of binary media systems, the acoustic velocity is in a fixed proportion to concentration and density. PIOX® S721 includes an extensive database of substances, thereby allowing for accurate and reliable density, concentration and mass flow determination in real time for a variety of acids, caustics and other chemical media.

Caustic Soda (NaOH)



Nitric Acid (HNO_3)



PIOX® S stands its ground where others fail

Concentration and mass flow measurement of sodium hydroxide

Chlor-alkali electrolysis is one of the central processes of the chemical industry. It provides the basic substances chlorine, sodium hydroxide and hydrogen.

At a major German chemical site, sodium hydroxide produced during chlor-alkali electrolysis is evaporated in a multi-stage distillation process. The Coriolis meter that was installed for concentration measurement was subject to enormous wear by the corrosive medium and did not achieve a satisfactory service life. Replacing the inline instrument is extremely time-consuming and requires a shutdown lasting several days for the shut-off and emptying of the pipeline.

Non-invasive measurement with PIOX® S proved to be the better solution. PIOX® S remains stable over the long term and without any measurement drift as proven by regular control measurements in the laboratory. Continuous accurate concentration measurement allows the system to run optimally at all times and ensures compliance with the specified quality. The PIOX® S simultaneously measures the mass flow.

Advantages:

- No wear and corrosion on the measurement system
- Highly durable and long term stable measurement without any measurement drift and maintenance-free
- No need for expensive special materials or bypass solutions

Concentration and mass flow measurement of nitric acid

One of Europe's largest fertiliser manufacturers uses PIOX® S in its nitric acid bottling plants. The nitric acid is traded in two different concentrations: 68 % and 60 %. If the lower concentration is required, the 68% nitric acid must be diluted by adding water. Compliance with the required concentration must be monitored by means of measuring technology.

The ideal solution for this measuring task is PIOX® S: Since the clamp-on ultrasonic transducers are simply mounted on the outside of the pipe, there is no direct contact with the aggressive medium. Thus there is no risk of corrosion or acid leakage, as it was in the case with previously installed Coriolis meters. Replacing an inline meter often requires an expensive process shut-down for emptying and cleaning of the pipe. Furthermore, simultaneous measurement of volume flow and density allows for the output of mass flow and thus the complete monitoring of the filling process.

Advantages:

- No risk of corrosion or leakage
- Simultaneous measurement of concentration and mass flow
- Non-invasive measurement, no process shut-downs necessary

PIOX® S – mass flow, density and concentration measurement without media contact

PIOX® S includes an extensive and continuously growing database for the non-invasive determination of mass flow and concentration of liquid media:

Medium	Concentration Measuring Range	Medium	Concentration Measuring Range
Acetic acid ($C_2H_4O_2$)	0 to 10% at -10 to 40 °C 45 to 100 % at 0 to 100 °C	Ferric sulfate ($Fe_2(SO_4)_3$))	0 to 55 % at -10 to 40 °C
Formic acid (CH_2O_2)	0 to 100 % at 40 to 120 °C	Ferrous chloride ($FeCl_2$)	0 to 45 % at -10 to 105 °C
Hydrochloric acid (HCl)	0 to 150 % at 0 to 30 °C 18 to 40 % at 40 to 120 °C	Ferrous sulfate ($FeSO_4$)	0 to 30 % at -10 to 105 °C
Hydrofluoric acid (HF)	30 to 100 % at -10 to 60 °C	Formalin (CH_2O)	0 to 15 % at -10 to 80 °C 0 to 50 % at -10 to 25 °C
Nitric acid (HNO_3)	50 to 100 % at 20 to 120 °C 0 to 100 % at 75 to 120 °C	Glycerol ($C_3H_8O_3$)	0 to 100 % at -10 to 120 °C
Phosphoric acid (H_3PO_4)	5 to 80 % at -10 to 50 °C	Hydrogen peroxide (H_2O_2)	0 to 37 % at -10 to 450 °C 12 to 37 % at -10 to 80 °C
Sulfuric acid (H_2SO_4)	80 to 100 % at -10 to 250 °C	Isopropyl alcohol (C_3H_8O)	15 to 100 % at -10 to 120 °C
Caustic potash (KOH)	0 to 55 % at -10 to 120 °C	Lithium bromide (LiBr)	0 to 70 % at -10 to 120 °C
Caustic soda (NaOH)	0 to 55 % at -10 to 110 °C	MDEA (CH_3N-$(CH_2CH_2OH)_2$)	0 to 45 % at -10 to 50 °C 70 to 100 % at 0 to 50 °C
Aceton (C_3H_6O)	0 to 10 % at -20 to 50 °C 30 to 100 % at 20 to 105 °C	Methanol (CH_3OH)	0 to 14 % at -10 to 40 °C 15 to 100 % at 45 to 80 °C
Ammonia (NH_3)	0 to 40 % at -20 to 105 °C	NMP (C_5H_9NO)	0 to 40 % at -10 to 60 °C 55 to 100 % at 50 to 120 °C
Ammonium nitrate (NH_4NO_3)	0 to 100 % at -10 to 180 °C	Oleum (SO_3)	0 to 25 % at -10 to 50 °C 40 to 100 % at -10 to 50 °C
Ammonium sulfate ($(NH_4)_2SO_4$)	0 to 55 % at -10 to 120 °C	Potassium chloride (KCl)	0 to 35 % at -10 to 125 °C
Calcium chloride ($CaCl_2$)	0 to 55 % at -10 to 120 °C	Propylene glycol ($C_3H_8O_3$)	0 to 25 % at -20 to 80 °C 60 to 100 % at 10 to 120 °C
Caprolactam ($C_6H_{11}NO$)	0 to 50 % at -10 to 40 °C 60 to 100 % at 40 to 120 °C	Sodium carbonate (Na_2CO_3)	0 to 40 % at -10 to 120 °C
Diethylene glycol ($C_4H_{10}O_3$)	0 to 45 % at -20 to 65 °C 60 to 100 % at 50 to 120 °C	Sodium chloride (NaCl)	0 to 32 % at -10 to 120 °C
DMAC (C_4H_9NO)	0 to 40 % at -10 to 55 °C 50 to 100 % at 45 to 120 °C	Sodium hypochlorite (NaClO)	0 to 20 % at -10 to 80 °C
DMF (C_3H_7NO)	0 to 40 % at -10 to 55 °C 50 to 100 % at 45 to 120 °C	Sodium sulfate (Na_2SO_4)	0 to 40 % at -10 to 120 °C
Ethanol (C_2H_5OH)	0 to 10 % at -20 to 60 °C 20 to 100 % at 20 to 105 °C	Sodium sulfide (Na_2S)	0 to 30 % at -10 to 60 °C
Ethylene glycol ($C_2H_6O_2$)	0 to 60 % at -30 to 40 °C 55 to 100 % at 80 to 120 °C	Triethylene glycol ($C_6H1_4O_4$)	0 to 40 % at -20 to 80 °C 50 to 100 % at 60 to 200 °C
Ferric chloride ($FeCl_3$)	0 to 35 % at -10 to 50 °C 35 to 55 % at 70 to 105 °C	Urea (CH_4N_2O)	0 to 100 % at -10 to 120 °C

The media listed here are available as standard data sets for PIOX® S. Alternative media sets can be analysed for proposal upon customer request.

The table above refers to density and mass flow measurements at dynamic concentration measurement in real-time. For constant media concentration (respectively density), mass flow measurement is possible over the entire temperature range.

FLEXIM

More than 25 years of experience in ultrasonic flow measurement and process analytical technologies

PIOX® S	Clamp-on ultrasonic measurement system for the non-intrusive mass flow, concentration and density determination of acids, caustics and other chemical media
Accuracy Mass Flow:	±1.2 % of reading ±0.01 m/s (factory calibrated) ±0.5 % of reading ±0.01 m/s (process calibration)
Concentration:	up to ±0.1 % of reading
Density	up to ±0.1 % of reading
Repeatability:	0.15% of reading ±0,01 m/s
Operating temperature Pipe temperature:	-40 °C ... +200 °C (up to +400 °C with WaveInjector®)
Flow velocity:	0.01 ... 25 m/s
Inputs:	maximum 4, available are: temperature (Pt 100/1000), current, voltage, binary or temperature, density, viscosity over fieldbusses
Outputs:	many combinations possible, selectable are: (switchable) current (0/4 mA ... 20 mA), voltage, frequency, binary
Communication: Service Interfaces: Process Interfaces:	 USB, Ethernet HART, Modbus RTU/TCP, FF H1, Profibus PA, BACnet MS/TP or IP
Protection Degree Transducers:	IP65 up to IP68, ATEX (IECEx) Zone 1 / 2 certified variants available. Material transducer mountings: Stainless steel 304 or 316
Protection degree Measuring transmitter:	up tp IP66, ATEX (IECEx) Zone 2 certifed variants available. Housing material: Aluminium or stainless steel 316L

FLEXIM

FLEXIM GmbH, Germany
Phone: +49 30 93 66 76 60
info@flexim.de

FLEXIM Austria GmbH
Phone: +43 33 26 529 81
office@flexim.at

FLEXIM Instruments Benelux B.V.
Phone: +31 10 24 92 333
benelux@flexim.com

FLEXIM France SAS
Phone: +33 4 27 46 52 10
info@flexim.fr

FLEXIM Instruments UK Ltd.
Phone: +44 1606 781 420
sales@flexim.co.uk

FLEXIM Middle East
Phone: +971 4430 5114
salesme@flexim.com

FLEXIM Instruments Asia Pte Ltd.
Phone: +65 67 94 53 25
salessg@flexim.com

FLEXIM Instruments China
Phone: +86 21 64 95 75 20
shanghai@flexim.com

FLEXIM S.A, Chile
Phone: +56 22 32 03 62 80
info@flexim.cl

FLEXIM AMERICAS Corporation
Phone: +1 63 14 92 23 00
salesus@flexim.com

FLEXIM Service and Support Center South America
Phone: +54 11 49 20 71 00
flexim@escoarg.com.ar
www.escoarg.com.ar

www.flexim.com

Subject to change without notification 05/2018
BUPIOXSV3-1EN